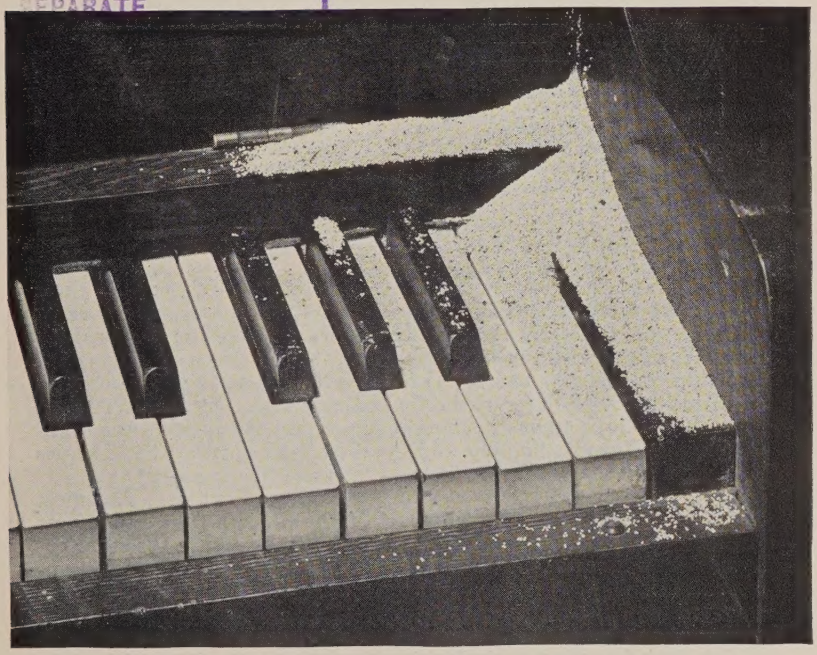
Control of NONSUBTERRANEAN TERMITES

EXD.
ENTOMOLOGY LIBRARY
19 MAR 1951
SERIAL U.S.A. 69



Farmers' Bulletin No. 2018
U. S. DEPARTMENT OF AGRICULTURE

1950

CONTROL OF NONSUBTERRANEAN TERMITES

By THOMAS E. SNYDER, *entomologist, Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration*[1]

Contents

	Page
Distribution	3
Damage caused by nonsubterranean termites	3
The nonsubterranean termite colony and how it lives	8
Evidences of infestation	9
Termite plugs	9
Pellets of excreta	9
Shelter tubes and partitions	10
Surface blisters	10
Hollow sound on tapping	12
Preventive measures	13
Inspection of lumber before use	13
Screening	13
Preventive measures—Continued	
Chemical treatment of wood	13
Protection with paint	13
Use of termite-resistant woods	14
Use of steel or concrete construction	14
Remedial measures	14
Replacement of infested wood	14
Use of heat or cold	14
Use of insecticides	15
Fumigation	16
How to restore damaged surfaces	16

NONSUBTERRANEAN termites may attack wood products of all kinds in warm, humid regions. Structural timbers and woodwork in buildings, as well as furniture and other wooden objects, may be damaged. These termites are less widespread than the subterranean type,[2] and they are usually less injurious. Nevertheless, there are enough of them in certain parts of the United States to constitute a menace to buildings and other wood products, especially in southern California and Florida, notably at Key West. In parts of the Tropics they are a serious problem.

There are several kinds of nonsubterranean termites. The most common are the dry-wood termites (*Kalotermes* spp.). Powder-post termites (*Cryptotermes* spp.) attack dry wood. Other species, *Zootermopsis* spp., infest rotten wood; still others, *Paraneotermes simplicicornis* (Banks) and *Neotermes castaneus* (Burmeister), prefer damp wood.

[1] E. A. Back, formerly with the Division of Insects Affecting Man and Animals, furnished many of the photographs and some of the information given in this bulletin.

[2] Similar information on subterranean termites is given in Farmers' Bulletin 1911, Preventing Damage to Buildings by Subterranean Termites and Their Control.

Issued September 1950

Distribution

Nonsubterranean termites have been found in temperate, subtropical, and tropical regions of both hemispheres. However, they are common in only a few localities throughout the world. In North America they are restricted chiefly to warm coastal areas.

Dry-wood termites are found in a narrow strip along the Atlantic coast from Cape Henry, Va., to the Florida Keys, westward along the coast of the Gulf of Mexico to the Pacific coast as far as northern California (fig. 1), with a local infestation at Tacoma, Wash. On

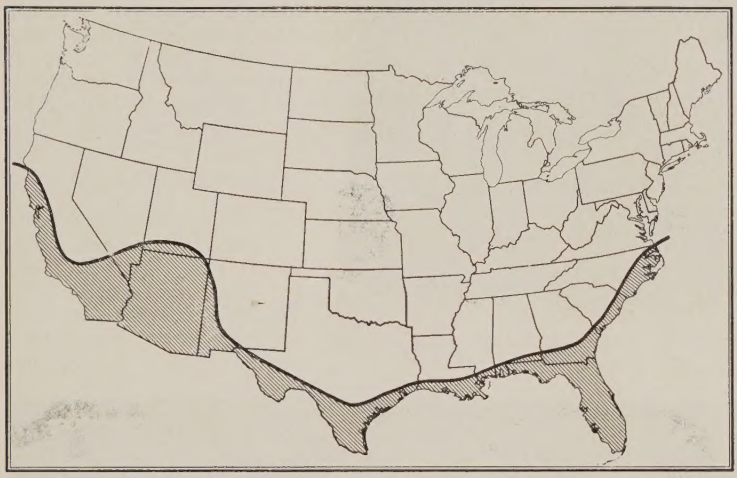


Figure 1.—Map showing northern limit of recorded damage by drywood termites.

this continent powder-post termites are restricted to Florida and Louisiana. The rotten-wood termites range from British Columbia and Vancouver Island southward along the Pacific coast to Baja California. They have also been found in Idaho, Montana, Nevada, Arizona, and New Mexico. The damp-wood termites occur in southern Florida, in the Southwestern States, and along the Pacific coast.

Damage Caused by Nonsubterranean Termites

In contrast to subterranean termites, which build tunnels up from the ground, when necessary, to attack wood, nonsubterranean termites fly directly to and bore into the wood. Infestations may be found in structural timber and other woodwork in buildings (figs. 2 and 3); in furniture (figs. 4 and 5); in poles for telephone, telegraph, and power lines; in wooden derricks and piled lumber; in paper and cloth; in woodpulp or fiber insulation boards (fig. 6); and in other products containing cellulose. These termites may also injure living trees and other woody plants.

In addition to furniture, other common articles that have been found damaged include images and leather-covered songbook bindings in cathedrals, piano keys, the wood of a plush and leather-bound

instrument case, X-ray cabinets, coat hangers, a drafting board, mantle clocks, picture frames, and a child's toy block.

Nonsubterranean termites cut across the grain of the wood and excavate broad pockets, or chambers, connected by tunnels about the diameter of the termite's body. They destroy both the soft spring wood and the harder summer growth, whereas subterranean termites attack only the spring wood. Cross sections through timbers infested with nonsubterranean termites do not show the definite pattern of destruction that is characteristic of damage by subterranean termites. The structural weakening is less serious and they work more slowly.

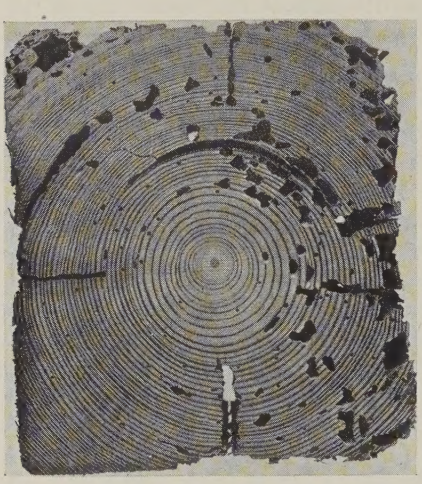


Figure 2.—A beam of pine heartwood damaged by dry-wood termites.

In certain localities, however, especially at Key West, Miami, and Tampa in Florida, and Los Angeles, San Diego, and other cities in southern California, nonsubterranean termites dam-

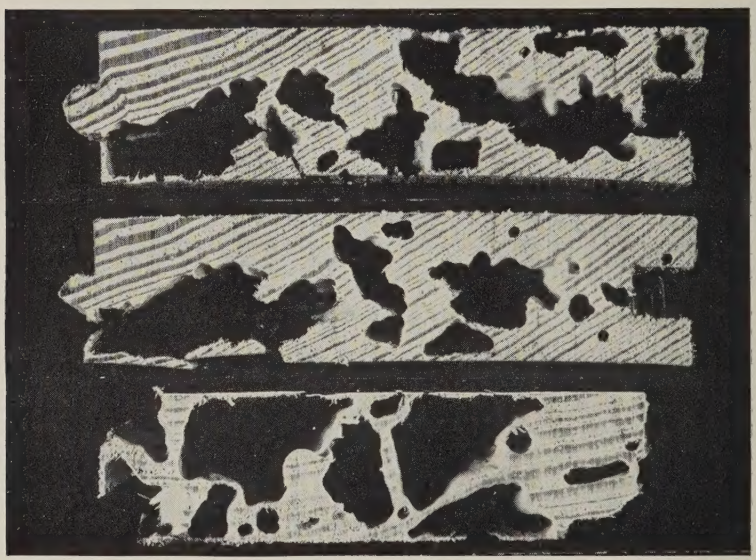


Figure 3.—Sections through pine floor boards infested with powder-post termites. Note the destruction of the tongue and groove of certain boards, which allows the floor to spring.

age buildings and furniture. Sometimes they so riddle telephone and power poles that it is dangerous for linemen to climb them.

In the San Francisco Bay section rotten-wood termites infest more buildings than do subterranean termites. At Key West the rough-headed powder-post termite is responsible for practically all the damage caused by termites.

It is in the tropical regions outside the United States that damage by nonsubterranean termites is most severe. In Havana and most

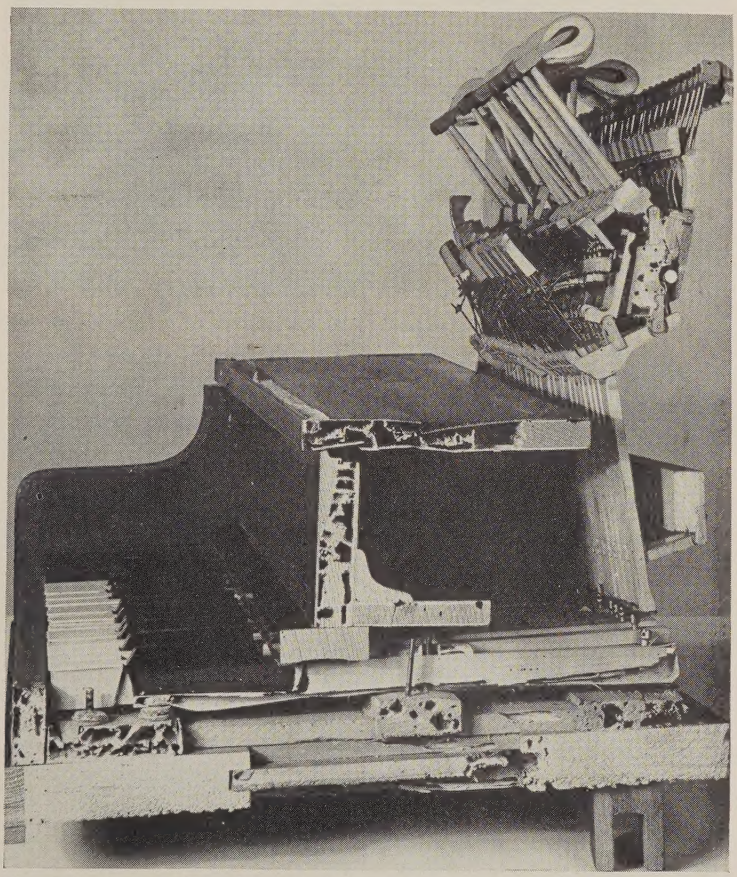


Figure 4.—Cross section of a piano infested with dry-wood termites, showing the wooden mechanism.

other cities in Cuba, for instance, it is so severe that building codes prohibit the construction of wooden floors. In that country wood for the construction of buildings is restricted to rural sections, where termite-resistant woods are in use.

In Mexico, Central America, and South America nonsubterranean termites occasionally destroy furniture and other wooden material

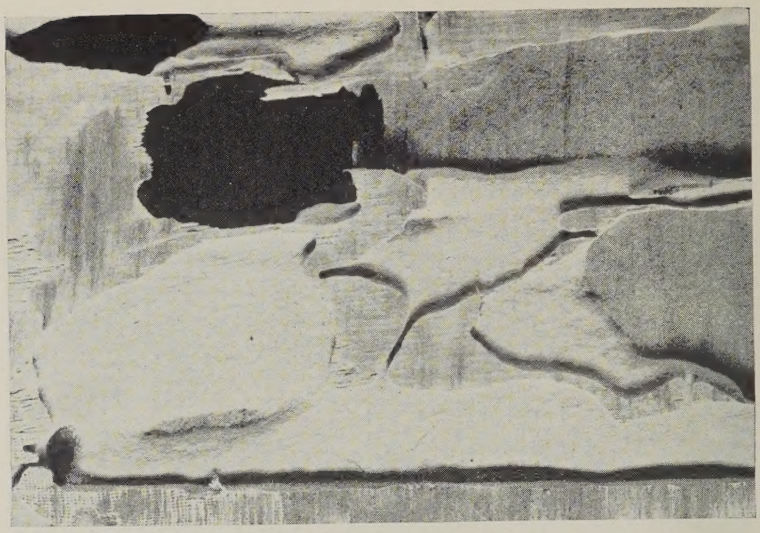


Figure 5.—Section of mahogany-veneered bookcase damaged by nonsubterranean termites.

Figure 6.—Fiberboard damaged by powder-post termites.

in buildings. Damage has been found at altitudes as high as 8,000 feet in Colombia, Guatemala, and Mexico.

Nonsubterranean termites are easily spread because they can live in wooden objects that are frequently moved (fig. 7). They have been found infesting furniture in many localities outside their normal range, even as far north as Canada. In Cleveland, Ohio, flooring in a church was found to be infested, and in Wichita, Kans., a 2-year-old colony was found in a house. Recently a sewing machine shipped from Puerto Rico and a trunk from Cuba (fig. 8) were found infested

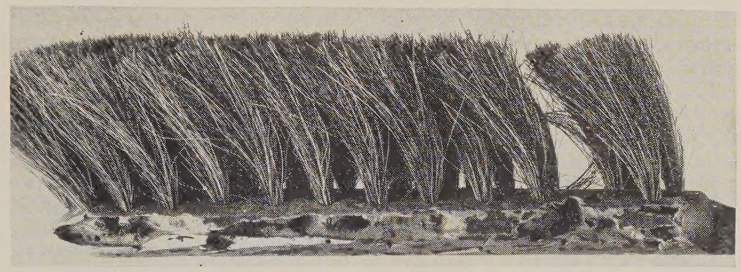


Figure 7.—A dust brush damaged by dry-wood termites.

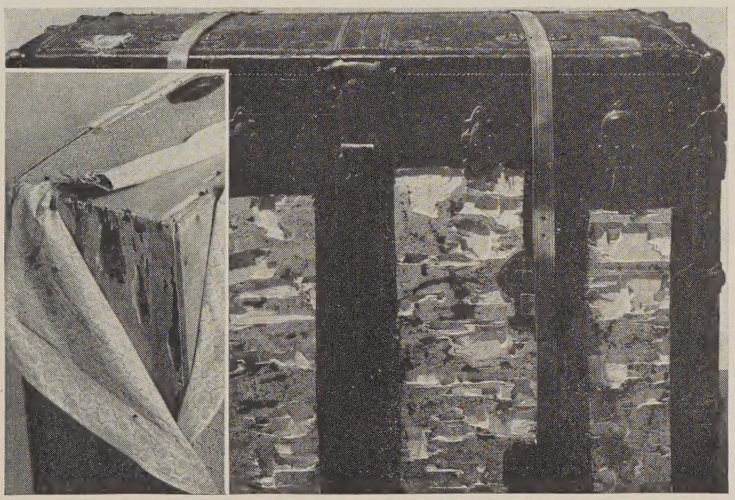


Figure 8.—Trunk with canvas cut away to show the many feeding chambers in the basswood lining. Insert shows injury to wood in the corner of the tray. This trunk was shipped from Havana, Cuba, to West Virginia, and thence to Washington, D. C.

when they reached Washington, D. C. However, these termites have not become established in any of these northern localities. Besides being transported in furniture and lumber originating in infested areas, they may be spread along transportation lines in utility poles and fence posts.

The Nonsubterranean Termite Colony and How It Lives

Nonsubterranean termites, like their subterranean relatives, live in colonies. Whereas subterranean termites live in the ground, these termites live in the wood throughout their lives. There are only two castes of adults—the reproductives and the sterile soldiers. There is no worker caste, as in subterranean termite colonies. The work is done by the young nymphs before they become mature adults.

The reproductive adults may be light yellow to dark brown or blackish. The different kinds range in length from 1/3 to 1 inch. They can be distinguished from subterranean termites by the presence of branches between the upper rim of the wing and the first long vein below.

The soldiers are comparatively large, wingless forms. They are the protectors of the colony, and have powerful jaws for fighting purposes, with teeth along the inner edge. Subterranean termite soldiers do not have these teeth.

When the reproductives first become adults, they have wings and can fly. Those that fly at night are attracted by lights. If the lights shine through closed windows, the termites may congregate on the sills. If they emerge inside a building, they cluster against the glass, trying to escape, most of them dying in the attempt.

Unless carried by the wind, nonsubterranean termites fly only short distances in search of a place to start a new colony. As soon as they find suitable quarters, they rid themselves of their wings, and the males and females pair off and bore holes into the wood (fig. 9).

When a male and a female are established in the wood, they plug the openings with small particles of excrement held together with a dark cementlike substance which they secrete from their mouths. The female, or queen, soon begins to lay eggs, usually one at a time. These eggs hatch into tiny white nymphs.

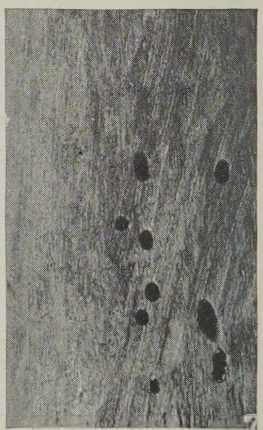


Figure 9.—Entrance holes of reproductive adults in dead cottonwood tree in Arizona.

The male continues to live with and fertilize the female. As the colony grows the tunnels are enlarged laterally. Colonies grow very slowly, and even old colonies contain only a few thousand individuals. They are much smaller than colonies of subterranean termites.

The entire colony is not confined to a single chamber, but is distributed throughout galleries in the wood. The nymphs keep the galleries clean, and permit no pellets of excreta or other dirt to remain where they are feeding. They either place these pellets in unused chambers or cast them outside through small openings in the wood. In this habit they differ from subterranean termites.

The dry-wood and powder-post termites attack dry sound wood, in which their colonies live without contact with the ground. These

are the species that damage furniture and other woodwork within buildings. The damp-wood and rotten-wood termites, however, require moisture. They may be found in the sapwood and heartwood of living trees, as well as in timber. Damp-wood termites may leave the wood to burrow into the earth; they have been known to attack fruit trees by burrowing from root to root.

Evidences of Infestation

Nonsubterranean termites are seldom seen. They remain hidden within the wood, except when they make dispersal flights. Piles of shed wings are evidences of such flights. These termites never crawl freely over exposed surfaces, as ants do. However, there are several other external indications of infestations.

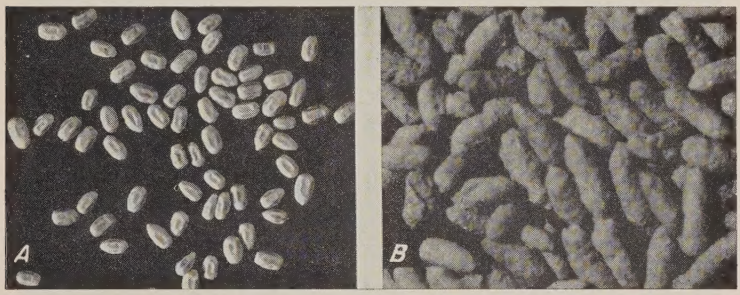


Figure 10.—Excretal pellets of nonsubterranean termites (*A*), which have concave surfaces, and of anobiid powder-post beetles (*B*), which have convex surfaces.

Termite Plugs

Nonsubterranean termites seal all openings in the wood with a brownish or blackish substance which they secrete. This secretion soon hardens into cementlike plugs, usually paper thin. These plugs may contain pellets of excreta. The openings may have been made by boring beetles, or they may be the entrance holes of the original pair of adult termites, exit holes made for a colonizing flight, or holes cut to change the temperature and humidity in the galleries. Termites of all types practiced air-conditioning long before man did.

Pellets of Excreta

Nonsubterranean termites excrete pellets of partly digested wood; subterranean termites do not. These pellets, which vary in size, may be found in the tunnels and in piles on the floor where they have been ejected from infested wood. The color is usually that of the wood fed on by the termites. There is one powder-post beetle, an anobiid, that also ejects pellets from the wood, but termite pellets can be distinguished by their concave surfaces (fig. 10). These pellets are often the householder's first warning that nonsubterranean termites are at work.

Shelter Tubes and Partitions

These termites may also construct thick, narrow shelter tubes of secreted substances and excretal pellets (fig. 11) to serve as passageways from one piece of wood to another. If the pieces are no more than half an inch apart, the termites may wall in the space between them. Using the cementlike substance for walls, they may also partition off large chambers into several smaller ones.

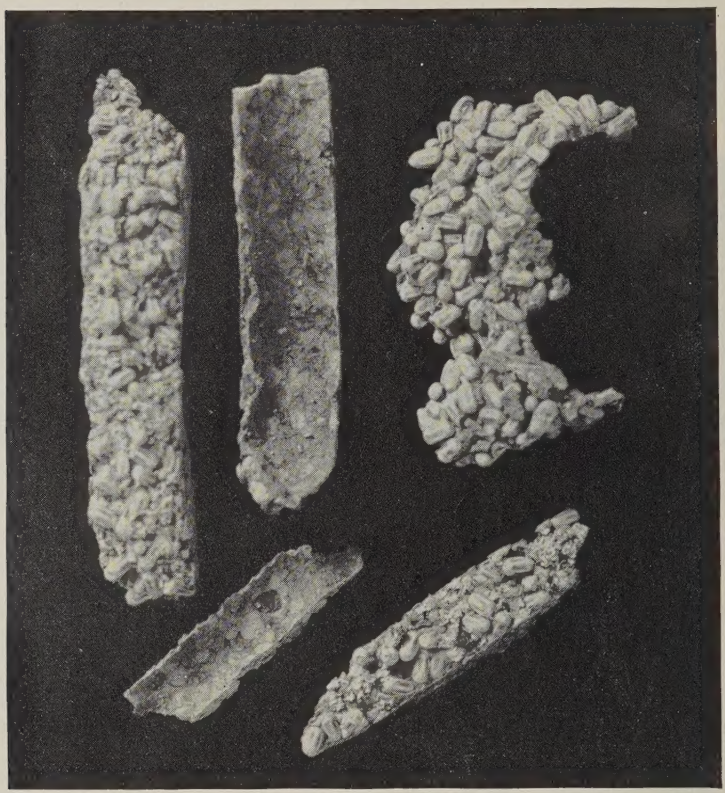


Figure 11.—Shelter tubes composed of excretal pellets, constructed by powder-post termites.

Surface Blisters

These termites may form chambers close to the surface of the wood. They eat the wood away, leaving only the merest film, or blister (fig. 12), if the wood is unpainted, or only a flimsy coating of paint (fig. 13) on painted surfaces. The surfaces of infested floor boards and door frames in daily use become pitted in patches or roughened by frequent rubbing, and may eventually be worn away. The delicate turnings

Figure 12.—Blisters in surface of wood caused by dry-wood termites.

Figure 13.—Part of painted pine wall of a room in which termites have eaten cavities until the paint film has broken away.

and moldings of radio cabinets break away in spots. Wooden appliques on furniture lose their beauty from surface breaks after the interior has been destroyed.

Hollow Sound on Tapping

Infested wood may also be detected by tapping the wood with the finger or a piece of metal. A hollow sound or papery rustle may indicate the presence of termite tunnels just beneath the surface (fig. 14).

Figure 14.—A pine door panel infested with powder-post termites. *A*, an undisturbed infestation indicated by the papery rustle as the hand was passed over the panel. *B*, the same panel after being brushed.

Preventive Measures

In regions where nonsubterranean termites occur, certain measures should be taken to prevent them from causing damage.

Inspection of Lumber Before Use

All lumber, especially second-hand lumber, used for construction purposes should be inspected carefully for evidences of infestation, such as plugs and pellets of excreted wood. Infested lumber should never be used. Lumber discarded from infested houses that are being remodeled is a source of danger and should be burned.

The transportation and re-use of lumber infested with nonsubterranean termites is prohibited by law in the Canal Zone, in Panama, and in Pasadena, Calif. At Honolulu, Hawaii, it is prevented by police regulation.

Screening

All doors, windows, especially attic windows, and other ventilation openings should be screened with noncorrodible-metal wire cloth, preferably having 20 meshes to the inch. Such screens will prevent the entrance of winged termites from the outside.

Chemical Treatment of Wood

Construction timbers can be pretreated or impregnated with a chemical wood preservative to prevent termite attack. Timber so treated can be purchased in some localities.[3] Such treatment is costly, however, and is practicable only for use in large buildings or for public-service poles and similar equipment.

If impregnated timber is not available, considerable protection can be obtained by dipping timbers for 3 minutes in a 5-percent solution of pentachlorophenol in light petroleum oil, or brushing them with this solution. If applied by brushing, three coats are required. Care should be taken that all surfaces, including the ends and mortises or other cuts, are thoroughly treated.

Fiber or wood-pulp products may be treated with white arsenic or pentachlorophenol to protect them from damage, but the treatment is usually made in the process of manufacture.

Protection With Paint

Several coats of heavy paint will give the exterior woodwork of buildings considerable protection against termite entry. All cracks, crevices, and joints between timbers should first be filled with putty or plastic wood.

---

[3] Specifications for wood preservatives suitable for such use, approved by the Director of the Federal Supply Service, are obtainable from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Ask for Federal Specifications TT–W–571c.

Use of Termite-Resistant Woods

Many kinds of termite-resistant woods have been found throughout the world. Such woods should be used, if possible, where there is danger of infestation. Of construction timbers, the close-grained heartwood of foundation-grade redwood, tidewater-red baldcypress, or very pitchy (lightwood) longleaf pine—especially if painted—give greatest protection against nonsubterranean termites. Most furniture woods native to the United States except black walnut are susceptible, but the heartwoods of true mahogany and Spanish cedar are resistant cabinet woods grown in the American Tropics. In Central America and South America certain other native timbers are resistant to termite attack.

Use of Steel or Concrete Construction

The use of steel, concrete, stone, or brick, instead of timber, in building construction offers the best protection against nonsubterranean termites. However, it will not prevent infestations of wooden materials inside unless the building is thoroughly screened.

Remedial Measures

When wood has been found infested with nonsubterranean termites, certain remedial measures may be taken to keep them from doing further damage.

Replacement of Infested Wood

If the damage is slight or localized, the infested wood should be removed and replaced with sound material. Infested lumber, woodwork, or furniture should not be transported or sold for reuse elsewhere. If the damage is more general, and structural weakening is evident, the infested timber should be removed, destroyed, and replaced either with chemically treated wood or, preferably, with steel. Where it is desired to retain the original appearance, the timbers may be reinforced with concealed structural steel.

Use of Heat or Cold

Termites in infested furniture will be killed if the furniture is held for 1½ hours in a chamber heated to 150° F., or for 4 hours in a chamber heated to 140°. Kilns or special vaults equipped with heating units using steam or electricity may be used for the purpose. This treatment is also likely to kill most other insects, such as bedbugs, carpet beetles, and clothes moths, that might be present in the furniture.

Cold has also been used to kill these termites. In northern climates infested furniture and crates may be moved outdoors in winter; in the Tropics they may be placed in refrigerating vaults. Exposure at a temperature of 15° F. for 4 days will kill the termites within the wood.

Where wood has been extensively damaged but not structurally weakened by these termites, an insecticide—either a liquid or a dust—may be injected into their galleries. To reach the galleries auger holes should be bored into the wood about 18 inches apart. The insecticide may be used either in liquid or in dust form. After treatment the holes should be sealed with putty or similar material.

Liquids

One effective liquid insecticide is trichlorobenzene, which is volatile and kills the termites as it vaporizes. The following insecticides dissolved in fuel oil at the strength indicated will leave a toxic residue in the galleries: DDT 6 percent, chlordane 2 percent, pentachlorophenol 5 percent, and enough benzene hexachloride to give 0.4 percent of the gamma isomer. These materials may be applied with a knapsack type of sprayer by inserting the spray rod, without the nozzle, into the holes. Trichlorobenzene and pentachlorophenol may also be sprayed onto the surface of the wood. Such treatment may remove the paint or varnish on furniture, but it can be refinished easily.

In buildings where food is handled or stored, the infested wood should be removed, if possible, before it is treated. After treatment it should be held outdoors for several weeks until all traces of disagreeable odor have disappeared. When the insecticides must be used inside the building, the rooms should be well ventilated after the treatment.

In southern California public-service poles infested with dry-wood termites have been treated successfully with coal-tar creosote. Vats used for this purpose are long enough to treat the entire pole and wide enough to handle four poles at once. The creosote is first heated to 180°–200° F. The poles are left in the vats for 1 hour and then removed and dried for 5 hours.

Dusts

When it is not practicable to use a liquid poison, a dust may be blown into the galleries with bellows. The dust adheres to the bodies of the termites, and thus the poison is spread from gallery to gallery until the entire colony is destroyed.

Several arsenical dusts, such as smelter dust, white arsenic, and paris green, as well as DDT (50 percent), are suitable. Sodium fluosilicate is not quite so effective, but is less poisonous to man and animals.

Care should be taken not to blow in too much dust, lest the termites wall off their galleries. In local infestations one-half teaspoonful in each hole is sufficient.

In large-scale operations the use of commercial dust guns which maintain pressures of 70 to 75 pounds per square inch will give better distribution of the dust. An ounce of dust for every 15 to 30 holes should be enough.

Sometimes dust blown into termite galleries becomes caked from moisture. If inspection shows that this has happened, the treatment should be repeated. The holes should be sealed after the operation has been completed.

Caution.—**All these insecticides are poisonous to man and animals. They should be handled with care and in accordance with instructions on the labels of the containers. They should not be applied where they might contaminate food or drinking water, and should be stored out of reach of children and pets.**

Trichlorobenzene, pentachlorophenol, and coal-tar creosote are particularly irritating to the skin and eyes. When these materials are applied, the hands should be protected and care should be taken to keep the material away from the eyes.

Since mixtures containing fuel oil are inflammable, they should be kept away from open flames.

Fumigation

Detached houses heavily infested with nonsubterranean termites have been fumigated with success. This method is quicker and often cheaper than the use of poison liquids and dusts, but it does not prevent the termites from returning, since no poisonous residue is left in the galleries. **Moreover, fumigation is very dangerous, and should be conducted only by licensed fumigators.** It is particularly desirable where there are several heavily infested detached buildings with inaccessible infested timbers.

Occupants should not reenter a fumigated building until it has been thoroughly aired—48 hours after fumigation with hydrogen cyanide and 24 hours after fumigation with methyl bromide. Altogether it requires 4 days to treat and aerate a house with the cyanide and 2 days with the bromide treatment.

How to Restore Damaged Surfaces

When infested wood has lost its firmness or is unsightly but still strong enough for its intended use, wiping it with melted paraffin will restore its body. The excess paraffin should be removed with a rag and the wood then refinished. If the damage is more severe, it may be necessary to cut away the injured wood with a chisel and fill the cavity with putty or plastic wood. The entire article should then be refinished.

U. S. GOVERNMENT PRINTING OFFICE: 1950

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 5 cents